

# PATENT SPECIFICATION

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## (54) SAFE UNIT FOR RECEIVING BANK NOTES

(71) We, HAUNIWERKE KORBER & CO KG., a German Company of Kampchaussee 12-22, 2050 Hamburg 80, Germany (Fed. Rep.), do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

The invention relates to a safe unit for receiving bank notes of various values in compartments provided for each value.

The term "safe unit" is intended to mean strong boxes, safes and other containers which can be closed, which in the cash offices of financial institutions visited by the public, serve to receive bank notes paid in and from which bank notes to be paid out can be removed.

The increasing hold-ups on banks necessitate increased safety for these institutions. Thus it is not sufficient, in the way of a purely passive safety measure, to protect the money available as well as possible from falling into the hands of thieves, in that the cashier's cubicle is shielded hermetically and is bullet-proof from the outside according to an existing law in certain countries. Thieves are overcoming these safety measures to an increasing extent due to the fact that they threaten employees of the bank or customers and thus force the bank staff to hand over the money available at the counters of a financial institution and which is well secured.

A known security arrangement is based on the idea of precluding the possibility of the bank staff handing over all the money held in store and which is visible and recognizable to the thieves or at any rate making it more difficult due to the fact that the supplies of money are located in theft-proof safes or strong boxes, to which it is possible to gain access only with a certain predetermined time-lag which cannot be altered.

Since by far the greatest number of all bank hold-ups take place within several minutes, the danger of being apprehended for the thief is increased when he must wait for the predetermined period of time which cannot be altered by the cashier, after the expiration of which period of time the safe can be opened for the first time. Owing to the fact that the unalterability of the locking time is determined technically, the threatening of hostages cannot

hold out the prospect of any success so that this cannot be used for pressurizing the bank staff.

The object on which the invention is based consists of making it easier to work with safes or strong boxes of the afore-described type, in particular to place freely at the disposal of the cashier the larger sums of money which are placed under the protection of the time barrier and thus are only accessible after a time-lag and the immediately accessible, unprotected smaller quantities of money which are necessary in practice for carrying out transactions, without abandoning the basic idea of a deterrent as a result of the technically necessary time-lag for gaining access — at least for the major part of the money reserves.

According to one aspect of the present invention there is provided a safe unit comprising a plurality of containers each subdivided into adjacent compartments for holding bank notes and each having a respective closure member arranged to travel successively over the compartments during its opening and closing movement, locking means for locking the closure member against opening movement, and release means including actuating means operable to release the closure member for opening movement over one compartment only and delay means for delaying said release for a predetermined time interval.

In this case, in a constructionally simple manner, a closure member can be provided which is able to move over all the openings of the compartments of a container, with which member limiting means are associated for limiting the distance able to be covered for opening after actuation of the actuating member and the expiration of the time interval.

In other words, this means that a common closure member is associated with all the compartments of each container, the locking arrangement of which closure member can be controlled by way of an individual time-lag member such that only one compartment is released after a time interval. A certain portion of the entire amount located in one container is thus to be found in each compartment.

Whereas the invention prevents the cashier from being able to open more than one compartment with a predetermined maximum amount of money, before the expiration of the

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predetermined time interval, either deliberately or whilst being compelled to do so by a thief, a limitation of this type is not necessary when making a deposit in the container. According to one advantageous development of the invention, the closure member is able to move freely for closing the openings of the compartments. This condition can be fulfilled according to the invention in a constructionally simple manner due to the fact that the locking arrangement acting in the opening direction on the closure member is independent of a movement of the closure member in the closing direction.

According to the afore-mentioned principle that the security device should hinder the cashier's work as little as possible, in a further development of the invention, a drive able to be actuated by the time-lag member can be provided for the movement in the opening direction. This drive shifts the closure member in the opening direction by an amount which corresponds to the opening width of the compartment which was previously closed and adjoins the first compartment opened.

A closure member which is particularly suitable for the aforesaid arrangements of the invention is constructed as a roller shutter, since it can be guided on a curve inside the safe unit and therefore does not need to be guided on the outside.

The minimum time intervals necessary for fulfilling the security requirement depend on different circumstances, such as fluctuations in the requirement for money at different times of the day, police methods etc. In order to be able to adapt them rapidly to the respective factors, according to a further embodiment of the invention, the time-lag members are constructed such that the time intervals can be adjusted up to a predetermined lower limit. The adjustment advantageously takes place such that the time intervals of the containers for receiving bank notes of higher values are greater than the time intervals of containers for receiving bank notes of lower values. This has the advantage that the probability of losing bank notes of higher values in the case of a hold-up is considerably reduced, since possible thieves can hardly take the time to await these extended opening times. However, owing to the smaller amounts, with containers containing bank notes of lower values and correspondingly shortened time intervals, the possible losses are obviously less. On the other hand, in the course of normal business transactions, in particular at branch offices which are particularly threatened by hold-ups, higher value bank notes, for example 500 and 1000 DM notes are required relatively infrequently when paying out. Money paid in can be protected without a time-lag in that full compartments are closed simply by means of the closure members.

In order to enable the cashier to open all the compartments of the individual containers as desired, without a time-lag, for example after

business hours, the locking arrangements for all compartments can be released safely. The security may consist of a separate lock, which is not normally accessible or the key to which has been stored at a point remote therefrom.

At the place where the safe unit is used, a mounting may be provided, which comprises a secure releasable anchoring arrangement for the safe unit. This anchoring arrangement prevents the entire strong box from being removed at the time of a theft. In this case, the protection may consist of a further time-lag member with a particularly long time interval, which releases the anchoring arrangement. Waiting for the end of the time interval is tolerable when the office closes, whereas it is too long for a robbery lasting only a short time. After separating the container from the mounting, the above-mentioned locks for unlocking all compartments of the containers are then accessible, which has the advantage that after closing time for example, when thieves are no longer able to enter, all the compartments can be unlocked at the same time and the cashier thus has immediate access to the entire contents of the safe unit.

Still within the scope of the invention is an embodiment in which the individual containers can be transported separately and combined at the place of use, in that they are attached to a base plate, for example, where they form a safe unit.

Still within the scope of the invention is an embodiment in which only one or more containers able to be locked in the manner according to the invention are used for the highest values of bank notes, whereas the lower values of bank notes are located in containers which can be opened freely, which then preferably have the same external form as the locked containers.

Finally, the use of the safe unit according to the invention for receiving valuable objects other than bank notes is within the scope of the invention.

According to another aspect of the present invention there is provided a container with several adjacent compartments for bank notes, with a closure member able to move over all the openings of the compartments, with which are associated a drive for moving the closure member in the opening direction, a locking arrangement able to be released by an actuating member by way of an interposed time-lag member and limiting means for limiting the travel able to be covered after releasing the locking arrangement wherein a spring is provided as the drive for the closure member, which spring can be tensioned by closing the closure member, the locking arrangement and the limiting means comprise a ratchet wheel kinematically connected to the drive of the closure member and a first pawl which is attached in a stationary manner and is under a compressive load, a control member able to be

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controlled by the time-lag member, being provided for the periodic release of the pawl from the ratchet wheel and a second pawl is mounted on a lever able to tilt about a pivot of the ratchet wheel, which second pawl is connected to a crank drive able to be driven at a limited speed, the drive of which crank drive can be actuated by the time-lag member.

Stepping transmissions operating with two pawls on a ratchet wheel are known, but which are unsuitable for use in a container according to the invention on account of their high noise level at the time of successive engagement of the two pawls. In contrast hereto, the solution according to the invention is characterised by a low noise level and great robustness, in which case the drive can be very neat and economical, since it operates solely as a brake. When using force to open the closure member, the said drive (brake) can be overcome, but the opening of the closure member is prevented by the re-engaging pawl. According to a further feature, a particularly simple construction of the arrangement is provided in that the second pawl is adjacent the first pawl and with its drive serves as a control member for the first pawl.

The invention is described in detail hereafter with reference to the drawings illustrating one embodiment:

Figure 1 is a perspective view of a safe unit for receiving bank notes,

Figure 2 is a cross section through the safe unit of figure 1,

Figures 3 and 4 show control arrangements for the safe unit,

Figure 5 shows a variation of the locking arrangement of figure 2.

A safe unit 1 for receiving bank notes is formed by a housing 1 of steel plate, in which five containers 2 are located side-by-side, each for one type of note, namely 10DM, 20DM, 50DM, 100DM and 500DM notes. The containers 2 are separated from each other by side walls 3 and each container 2 is divided into several compartments 4 located one above the other, the dimensions of which are such that they are only able to contain a relatively small amount of money. Each container 2 comprises an individual closure member in the form of a roller shutter 6 associated with all its compartments 4, the segments 7 of which shutter are respectively guided in slots 8 in the associated side walls 3. Four spindles 9, 11, 12 and 13 are mounted in the housing 2 guided through the side walls 3, on which spindles, for each roller shutter 6, two chain wheels 14, 16 or 17, 18 are mounted to rotate freely directly adjacent the side walls 3. A chain 19 is respectively guided over the chain wheels 14, 16, 17 and 18, the two chains 19 belonging to one container 2 being partly connected by means of bars 21, to which the segments 7 are attached. The two chain wheels 18 associated respectively with one container 2 are attached to a hollow shaft 22 and are able to rotate together about the

spindle 13. Also attached to each hollow shaft 22 is a ratchet wheel 23, which co-operates with a pawl 27 mounted on a worm wheel 24 and loaded by a spring 26. The worm wheel 24 is kinematically connected by way of a slipping clutch (not shown) to the hollow shaft 22, whose torque is selected such that on the one hand, at the time of a rotary movement of the worm wheel 24, the chains 19 are moved with the segments 7, on the other hand, by way of a handle 28 on the last segment 7, the respective roller shutter 6 can be moved by hand in the closing direction (arrow 29) without excessive exertion, against the jamming action of the slipping clutch. An associated electric motor 32 is provided for each roller shutter 6 as a drive for the roller shutter 6 in the opening direction (arrow 31), attached to the shaft 33 of which motor is a worm 34 meshing with the respective worm wheel 24. The worm 34, the worm wheel 24 and the pawl 27 with the associated ratchet wheel 23 form a locking arrangement 36 to prevent a movement of the roller shutter 6 in the opening direction (arrow 31). An actuating member in the form of a push-button 37 is provided on the housing 1 for each container 2, for initiating a movement of the roller shutter 6 in the opening direction (arrow 31), which push-button is connected by a control arrangement shown in figure 3 to the electric motor 32 associated therewith. Trip cams 38 are provided on one of the chains 19 as limiting means for limiting the distance covered for opening, which trip cams are detected by a proximity detector 39. After opening the last compartment 4, a further proximity detector 41 detects a trip cam 42 of different shape, which can only be detected by this proximity detector 41.

The housing 1 can be anchored on a support 43, for example a counter, for which a bolt 46 provided with a groove 44 is attached to the support 43. The housing 1 comprises a recess 47 for the bolt 46, whereby an armature 49 of an electromagnet 51 constructed as a bolt, and loaded by a spring 48, engages automatically in the groove 44 when the housing 1 is placed on the support 43. A push-button 52 is located on the rear side of the housing 1 for exciting the electromagnet 51 by way of a control arrangement shown in figure 4. Provided in the recess 47 in the housing 1, which is deeper than the bolt 46 projecting therein, are the knobs of a time-lag member in the form of an electrical timing clock 53 and a push-button 54, which are both components of the control arrangement according to figure 3.

According to the control arrangement of figure 3, one of which is associated with each container 2, the push-button 37 is connected to a setting input *a* of a flip-flop member 56, whose output *c* is connected to a neon lamp 57 associated with the push-button 37 and to one input *a* of the timing clock 53. An output *c* of the timing clock 53 is connected by way

of a pulse-shaper stage 58 both to the cancellation inputs *b* of the flip-flop member 56 and of the timing clock 53 as well as to a dominating setting input *a* of a flip-flop member 59. A cancellation input *b* of the flip-flop member 59 is connected to the proximity detector 39 and its output *c* is connected by an OR-gate 61 to a control unit 62 of the electric motor 32.

The push-button 54 associated with all the containers 2 is respectively connected to a setting input *a* of a flip-flop member 63, to whose cancellation inputs *b* the proximity detector 41 is connected and to whose output *c* the control unit 63 is connected by way of the OR-gate 61.

In the control arrangement according to figure 4 for the electromagnet 51, the push-button 52 is connected to a setting input *a* of a flip-flop member 64, whose output *c* is connected to a neon lamp 66 associated with the push-button 52 and to one input *a* of a timing clock 67. This timing clock 67 can be adjusted once as regards the time-lag of an input signal as well as regards the duration of an output signal emitted after the expiration of the delay, after the emission of which it returns automatically to its zero position. An output *c* of the timing clock 67 is connected to a cancellation input *b* of the flip-flop member 64 and to an amplifier 68, to which both the electromagnet 51 as well as an acoustic signal transmitter in the form of a bell 69 are connected.

The safe unit operates as follows:

Outside banking hours of the financial institution, the safe unit 1 is stored in the vault of the financial institution, from which it is removed before opening the financial institution to the public. By way of the push-button 54 in the recess 47, the flip-flop members 63 of all containers 2 are set, so that the output signals from the flip-flop members 63 activate the control units 62 of the electric motors 32 by way of the OR-gates 61. The electric motors 51 drive the worm wheels 24 by way of the worms 34, which worm wheels 24 by way of the slipping clutches associated therewith, drive the hollow shafts 22 with the chain wheels 18 in the direction of arrow 31, due to which the chains 19 move the segments 7 in the direction for opening all compartments 4 of the containers. When the trip cams 42 reach the proximity detectors 41, the latter send a signal to the cancellation input *b* of the flip-flop members 63, which thus change their switching states, so that their output signals disappear and the electric motors 32 associated therewith are stopped. The compartments 4 of the individual containers 2 are each filled with a certain number of bank notes, however one or more of the lower compartments 4 remaining empty. The roller shutters 6 are then pulled down by the handles 28 to such an extent that only the lowermost compartment 4 filled with bank notes remains open for access. Closing of the roller shutters 6

by hand is possible, because the chain wheels 18 and the ratchet wheel 23 fixed thereto can be rotated in the opposite direction to arrow 31, by means of the associated slipping clutch, relative to the worm wheel 24 and its pawl 27. The pawl 27 locks only the ratchet wheel 23 against a relative movement with respect to the worm wheel 24 in the direction of arrow 31, the worm wheel 24 thus being prevented from carrying out any rotary movement by the worm 34, which means that after being drawn down by hand, the roller shutters 6 cannot be moved upwards. The timing clock 53 associated with the individual containers 2 are adjusted by means of their knobs in the recess 47 such that their time-lags are proportional to the value of the bank notes in the individual containers 2. The safe unit 1 prepared in this way is placed on the support 43, the recess 47 being fitted over the bolt 46, so that the armature 49 engages in the groove 44 of the bolt 46. The safe unit 1 is thus secured against unauthorised removal from the support 43 and access is denied to the knobs of the timing clock 53 and push-button 54.

If the cashier notes that in the course of business, the reserve of bank notes in a compartment 4 is running low, then he actuates the push-button 37 associated with the corresponding container 2. A signal passes from the latter to the setting input *a* of the flip-flop member 56, which then emits an output signal, which both activates the timing clock 53 as well as illuminates the neon lamp 57 associated with the actuated push-button 37. After the expiration of the time pre-set at the timing clock 53, the latter emits an output signal, which is shaped by the pulse shaper stage 58 to form a definite signal and is sent to the setting input *a* of the flip-flop member 59 and to the cancellation inputs *b* of the timing clock 53 and the flip-flop member 56. The flip-flop member 56 again changes its state, due to which its output signal disappears and the neon lamp 57 is extinguished. The timing clock 53 is returned to its zero position by the said signal and the flip-flop member 59 is set so that it actuates the control unit 62 of the electric motor 32 by way of the OR-gate 61. As afore-described, by way of the worm 34, worm wheel 24, associated slipping clutch and ratchet wheel 23 as well as chain wheels 18 and chains 19, the associated roller shutter is moved in the opening direction (arrow 31). However, this movement is interrupted when the next compartment 4 is open, because then a trip cam 38 reaches the associated proximity detector 39, which sends a signal to the cancellation input *b* of the flip-flop member 59, due to which the latter changes its state and its output signal disappears, so that the electric motor 32 is stopped. If the cashier requires a larger reserve of one type of bank note, then after the completion of the afore-described operating cycle, he can once more actuate the respective push-button 37, due to

which a further compartment 4 is opened after the expiration of the pre-set time.

Consequently, at the time of a bank robbery, the cashier is only able to hand over the bank notes which are immediately accessible in the open compartments 4.

In order to be able to remove the safe unit 1 from the support 43, the push-button 52 must firstly be actuated. A signal emitted by the latter passes to the setting input *a* of the flip-flop member 64, which then sends an output signal to the timing clock 67, this signal also causing the illumination of the neon lamp 66 associated with the push-button 52. After the expiration of the pre-set time interval, which is chosen to be relatively long, for example in the range of half an hour, the timing clock 67 emits an output signal, after a likewise pre-set time interval, which signal on the one hand cancels the flip-flop member 64 and thus the neon lamp 66 and on the other hand by way of the amplifier 68, excites the electromagnet 51 and activates the bell 69. The sound of the bell 69 draws the cashier's attention to the fact that he can now remove the safe unit 1 from the support 43, because as a result of the excitation of the electromagnet 51, its armature 49 is withdrawn from the groove 44 of the bolt 46, against the action of the compression spring 48. As afore-mentioned, after raising the safe unit 1, the cashier may actuate the push-button 54, due to which all the roller shutters 66 can be moved immediately upwards, so that all the bank notes can be removed.

The safe unit can be adapted to the individual requirements of various financial institutions, in that two or more containers 2 are provided for bank notes of one value for example or that the storage capacity of the compartments 4 of one container 2 is greater than that of another container 2.

Figure 5 shows a variation of the locking arrangement of figure 2, identical parts are given the same reference numerals, increased by 100. The chain wheels 118 are seated on a shaft 171, to which a ratchet wheel 172 is attached and on which a drive for the closure member in the form of the roller shutter known from figures 1 and 2 engages, in which case a spring 174 attached by one end to the shaft 171 and to the other end to the container frame 173 and looped around the shaft 171 serves as the drive. A first pawl 176 pivotally mounted on the container frame 173, which is pressed against the ratchet wheel 172 by a compression spring 177, serves for locking the ratchet wheel 172, the ratchet wheel 172 and pawl 176 forming a locking arrangement 175. The ratchet wheel 172 and pawl 176 also serve as limiting means 178 for the opening of the roller shutter, in that after releasing one tooth 172a of the ratchet wheel 172, the pawl 176 engages the next tooth 172a and prevents further rotation of the ratchet wheel 172.

Mounted on a pin 171a of the shaft 171 is

a lever 179, on which a second pawl 182 is pivotally mounted about a pivot 181. This second pawl 182 also comprises a control lug 182a, which acts intermittently on the first pawl 176, i.e. the second pawl with its drive 183 is a control member for the first pawl. The drive 183 consists of a crank drive 184, whose crank 186 is attached to the pawl 182 and can be driven by the electric motor 132 in the direction of arrow 188 by way of a transmission 187. The transmission 187, which has a high step-down ratio and can be constructed to be self-locking, together with the electric motor 132, serves for limiting the speed of the crank drive 184, which after the removal of the first pawl 176 by way of the second pawl 182, is loaded by the ratchet wheel 172 or the spring 174. Serving to control the electric motor 132 is the control arrangement from figure 3, whose construction and operation do not need to be described. Serving to stop the electric motor 132 is the proximity detector 139 actuated by the crank 186 on the transmission 187.

The paths of movement of the pawl 182 and control lug 182a on the pawl 182 are shown in dotted lines. In the inoperative position, the crank 186 is at the 6 o'clock position, so that after controlling the electric motor 132, the pawl 182 firstly rotates the ratchet wheel 172 by a small amount in counter-clockwise direction. Due to this, the pawl 176 is released from the tooth 172a, which it engaged hitherto, so that it can then be raised by the control lug 182a against the action of the compression spring 177 from the ratchet wheel 172. The crank drive 184 now guides the ratchet wheel 172 at a limited speed, which is determined by the electric motor 132 and the transmission 187. The control lug 182a of the pawl 182 thus once more lowers the pawl 176 onto the ratchet wheel 172, so that the next tooth 172a is engaged by the pawl 176. The pawl 182 is then raised from the ratchet wheel 172 and is returned to its initial position (6 o'clock position of the crank 186) by the electric motor 132 and crank drive 184, the electric motor 132 being stopped by means of the proximity detector 139 initiated by the crank 186.

WHAT WE CLAIM IS:-

1. A safe unit comprising a plurality of containers each subdivided into adjacent compartments for holding bank notes and each having a respective closure member arranged to travel successively over the compartments during its opening and closing movement, locking means for locking the closure member against opening movement, and release means including actuating means operable to release the closure member for opening movement over one compartment only and delay means for delaying said release for a predetermined time interval.

2. Safe unit according to claim 1, wherein the closure member is able to move over all openings of the compartments of a container

- and associated with which closure member are limiting means for limiting the distance able to be covered for opening, after actuation of the actuating means and after the expiration of the time interval.
3. Safe unit according to claim 1 or 2, wherein the closure member is able to move freely in the direction for closing the openings of the compartments.
4. Safe unit according to claim 3, wherein the locking means acting on the closure member in the opening direction is independent of a movement of the closure member in the closing direction.
5. Safe unit according to any one of the preceding claims wherein a drive able to be activated by the delay means is provided for the movement in the opening direction.
6. Safe unit according to any one of the preceding claims wherein the closure member is constructed in the form of a roller shutter.
7. Safe unit according to any one of the preceding claims wherein the time intervals of the delay means can be pre-set.
8. Safe unit according to claim 7, wherein the time intervals of the delay means can be pre-set to different values, in which case longer time intervals are associated with the containers intended for higher values of bank notes.
9. Safe unit according to any one of the preceding claims, wherein the locking means for all compartments of one container can be released securely.
10. Safe unit according to any one of the preceding claims, wherein a mounting is provided for the safe unit at its place of use and the mounting comprises a securely releasable anchoring arrangement for the safe unit.
11. Safe unit according to claim 10, wherein for releasing the anchoring arrangement, a time-lag member is provided, which can be actuated by an actuating member and releases the anchoring arrangement after the expiration of a time interval.
12. Container with several adjacent compartments for bank notes, with a closure member able to move over all the openings of the compartments, with which are associated a drive for moving the closure member in the opening direction, a locking arrangement able to be released by an actuating member by way of an interposed time-lag member and limiting means for limiting the travel able to be covered after releasing the locking arrangement wherein a spring is provided as the drive for the closure member, which spring can be tensioned by closing the closure member, the locking arrangement and the limiting means comprise a ratchet wheel kinematically connected to the drive of the closure member and a first pawl which is attached in a stationary manner and is under a compressive load, a control member able to be controlled by the time-lag member being provided for the periodic release of the pawl from the ratchet wheel and a second pawl is mounted on a lever able to tilt about a pivot of the ratchet wheel, which second pawl is connected to a crank drive able to be driven at a limited speed, the drive of which crank drive can be actuated by the time-lag member.
13. Container according to claim 14 wherein the second pawl is adjacent the first pawl and with its drive serves as a control member for the first pawl.
14. Safe unit substantially as hereinbefore described with reference to the accompanying drawings.
15. A container with several adjacent compartments substantially as hereinbefore described with reference to the accompanying drawings.
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Sheet 1

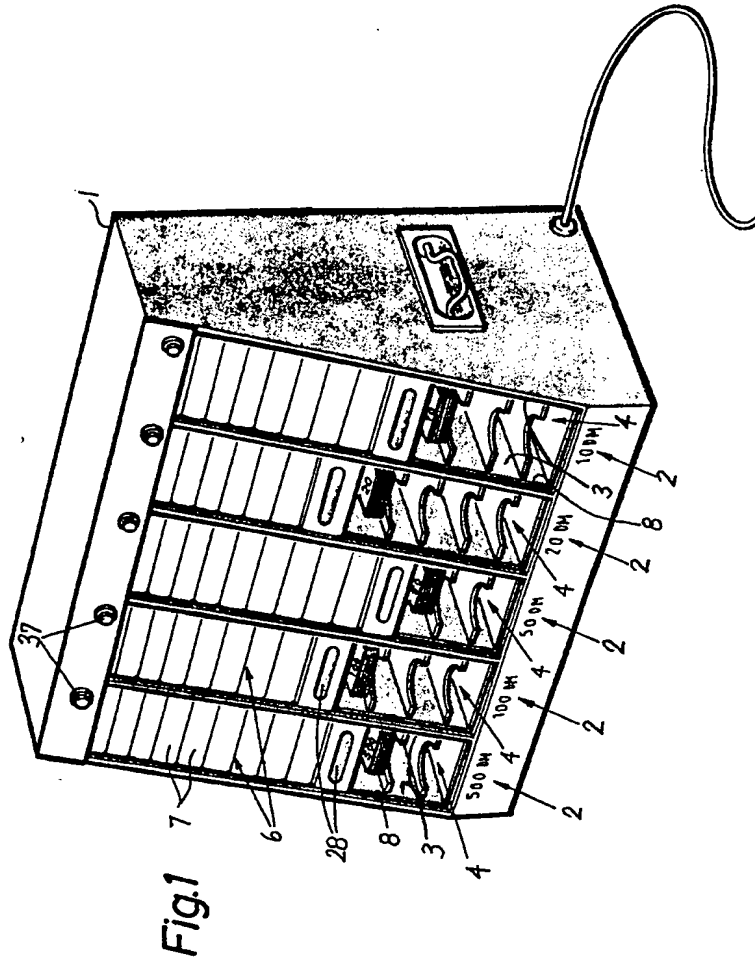
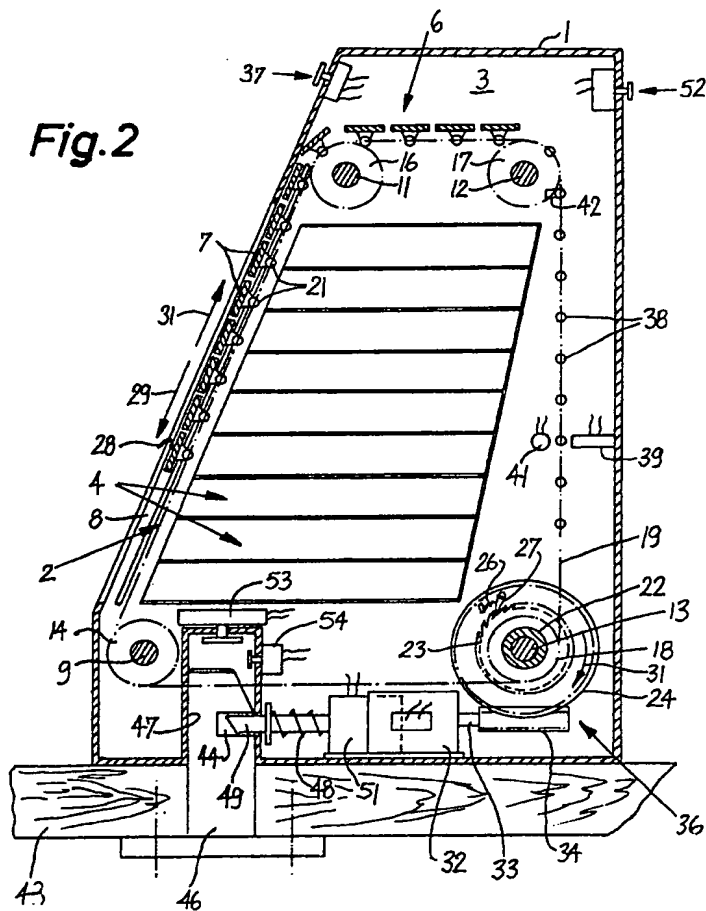


Fig.2





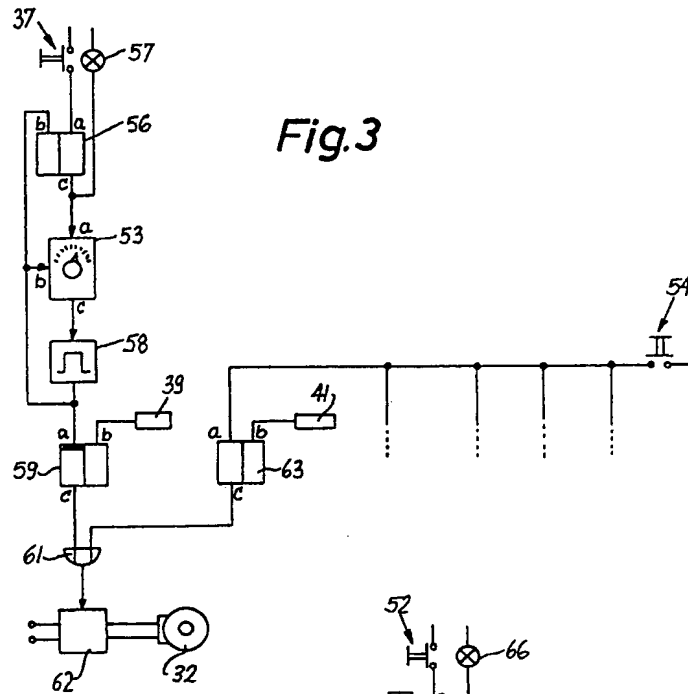
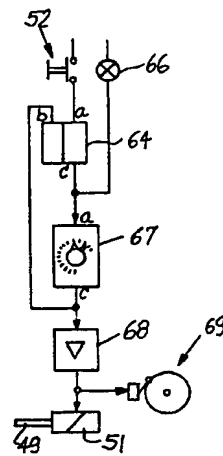


Fig. 4



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Sheet 4

